

REMARKS

Claims 1-20 are pending. Claims 1 and 10 are amended with this response. No new matter has been added. Reconsideration of the application in light of the following remarks is respectfully requested.

I. REJECTION OF CLAIMS 1-20 UNDER 35 U.S.C. § 103(a)

Claims 1-20 were rejected under 35 U.S.C. § 103(a) as being unpatentable over applicants' admitted prior art and U.S. Patent No. 6,468,362 (Chen et al.). Claims 1 and 10 are amended with this response. Withdrawal of the rejection is respectfully requested for at least the following reasons.

i. Chen et al. are silent regarding the use of a wetting agent in a second etch step, as presently claimed.

Claims 1 and 10 are directed to a method for etching a substrate comprising performing a first etch step followed by a first rinsing of the substrate using a wetting agent, wherein a subsequent second etching of the substrate is further performed utilizing the wetting agent of the first rinse step. Chen et al. are silent regarding the use of a wetting agent in a second etching step, as claimed. Chen et al. teach the utilization of a surfactant as an aid to avoid water marks on a surface of a wafer during a drying of the wafer. Chen et al. further teach that the surfactant also can prevent a pure DI water rinse from directly contacting the hydrophobic surface of the wafer (see, e.g., Chen et al. col. 3, lines 12-23).

Chen et al., however, also teach that the surfactant applied to the wafer is either fully or partially rinsed off the surface of the wafer by the DI water rinse. Regardless of whether the surfactant is fully or partially rinsed off the wafer, however, the surface of the wafer is dried, thus removing any surfactant-containing solution. Chen et al. clearly state that any remaining DI water and surfactant-containing solution are displaced from the hydrophobic wafer during drying, such as during a spinning of the wafer in an IPA dryer (see, e.g., Chen et al., col. 4, lines 13-

23, and col. 6, lines 38-44). Thus, the purpose of the surfactant used by Chen et al. is for the reduction of water marks during a drying of the wafer, and the surfactant is no longer present on the wafer after the wafer is dry. Chen et al. are silent regarding the utilization of the surfactant for any other processing of the wafer, such as a subsequent etching of the wafer.

- ii. ***One of ordinary skill in the art would not have been motivated to modify the admitted prior art in light of Chen et al. to arrive at the presently claimed invention, since the surfactant utilized by Chen et al. is removed from the wafer and the wafer is dried prior to performing any other process steps.***

Claims 1 and 10 are directed to a method for etching a substrate using a wetting agent in a first rinsing of the substrate, wherein a subsequent second etching of the substrate is aided by the reduced surface tension afforded by the wetting agent.

Accordingly, the present invention advantageously utilizes the wetting agent of the first rinsing agent to assist in penetrating deep structures during the second etching step by the reduced surface tension of the second etchant. (See, e.g., page 5, lines 5-34).

As stated above, Chen et al. teach the utilization of a surfactant as an aid to avoid water marks on a surface of a wafer, wherein the surfactant further prevents a pure DI water rinse from directly contacting the hydrophobic surface of the wafer (see, e.g., Chen et al. col. 3, lines 12-23). Chen et al. also teach that the surfactant applied to the wafer is either fully or partially rinsed off the surface of the wafer by the DI water rinse. Again, regardless of whether the surfactant is fully or partially rinsed off the wafer, ***the surface of the wafer is dried, thus removing any surfactant-containing solution.***

Thus, it is clear from the teachings of Chen et al. that the surfactant provides the desired advantage of ***limiting water marks from forming on the surfaces of the hydrophobic wafer during drying of the wafer,*** and that the surfactant and DI water is entirely removed from the wafer during the drying process. Accordingly, no residual

surfactant or DI water is present on the wafer after the wafer is dried, and Chen et al. merely utilize the surfactant as an aid to the rinse and drying processes in order to prevent water marks, as is commonly known in the art.

One of ordinary skill in the art would not have been motivated to combine the teachings of Chen et al. with Applicants' admitted prior art, as such a combination would require two drying steps to be performed. Namely, one drying step would occur after the first etch and rinse, and another drying step would be needed after the second etch and rinse. Such additional drying steps would deleteriously increase processing time for the substrate. Further, since Chen et al. teach the use of the surfactant merely as an aid in rinsing and drying the wafer and in preventing water marks, if one of ordinary skill in the art were to combine the teachings of Chen et al. with Applicants' admitted prior art, such a combination would require a drying step to be performed between the first rinse and second etching steps, wherein no surfactant would continue to be present during the second etch step.

Still further, even if one were to combine the teachings of Chen et al. with Applicants' admitted prior art, the resultant combination would not provide the advantageous second etching step recited in claims 1 and 10; namely, where the at least one wetting agent reduces a surface tension associated with the second etchant. The present invention does not have a drying step between the first rinsing and second etch, and thus advantageously uses the wetting agent of the first rinse as an aid in the second etch step in an inventive manner.

Again, Chen et al. are further silent regarding the use of the surfactant in a second etch step, as claimed, and no motivation is provided in Chen et al., Applicants' admitted art, or in any combination thereof to utilize such a surfactant in a second etch process, as presently claimed. Accordingly, independent claims 1 and 10 are non-obvious over the cited art. Therefore, claims 2-9 and 11-20 are further believed to be allowable over the cited art. Accordingly, withdrawal of the rejection of claims 1-20 is respectfully requested.

II. REJECTION OF CLAIMS 1-20 UNDER 35 U.S.C. § 112

Claims 1-20 were rejected under 35 U.S.C. § 112 as failing to comply with the written description requirement. Claims 1 and 10 are amended with this response, and withdrawal of the rejection is respectfully requested for at least the following reasons.

- i. The Specification clearly describes adding a wetting agent to a first rinsing agent, performing a first rinse, and performing a following second etch step utilizing the wetting agent to reduce surface tension during the second etch.*

Page 5, lines 5-34 and Figs. 2 and 3B of the present invention clearly describe a first rinse step being performed with a wetting agent added to a first rinsing agent, and then a second etch step being performed, wherein the wetting agent is utilized as an aid to the etching process. The surface tension of the aqueous solution of the second etchant is thus reduced by the wetting agent, and the second etchant can more successfully penetrate into the structures of the substrate (see, e.g., page 5, lines 28-34 and Fig. 3B).

Accordingly, claims 1 and 10 are believed to comply with the written description requirement, and are believed to be in condition for allowance. Withdrawal of the rejection of claims 1-20 is respectfully requested.


III. CONCLUSION

The claims currently under consideration are believed to be in condition for allowance.

Should the Examiner feel that a telephone interview would be helpful to facilitate favorable prosecution of the above-identified application, the Examiner is invited to contact the undersigned at the telephone number provided below.

Should any fees be due as a result of the filing of this response, the Commissioner is hereby authorized to charge the Deposit Account Number 50-1733, MAIKP131US.

Respectfully submitted,
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CERTIFICATE OF MAILING (37 CFR 1.8a)

I hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being deposited with the United States Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to: Mail Stop Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Date: January 26, 2007


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